



INVESTOR IN PEOPLE

The Patent Office
Concept House
Cardiff Road
Newport
South Wales
NP10 8QQ

I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein.

In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

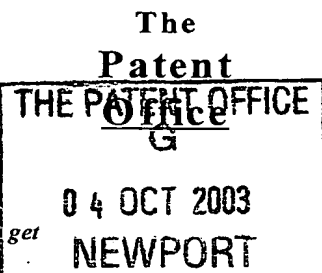
In accordance with the rules, the words "public limited company" may be replaced by p.l.c., plc, P.L.C. or PLC.

Re-registration under the Companies Act does not constitute a new legal entity but merely subjects the company to certain additional company law rules.

Signed

Dated 27 October 2003

4 OCT 2003



06OCT03 E842228-1 D01554
P01/7700 0.00-0323267.5
The Patent Office

Cardiff Road
Newport
South Wales NP9 1RH

Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

1. Your reference B433 GB2

2. Patent application number
(The Patent Office will fill in this part) 0323267.5

3. Full name, address and postcode of the or of each applicant (underline all surnames) TYCO ELECTRONICS RAYCHEM NV
DIESTSESTEENWEG 692
B-3010 KESSEL-LO
BELGIUM

Patents ADP number (if you know it) ~~8052002~~ 08306219001

If the applicant is a corporate body, give the country/state of its incorporation BELGIUM

4. Title of the invention SEALING DEVICE

5. Name of your agent (if you have one) Anthony William JAY
"Address for service" in the United Kingdom TYCO ELECTRONICS UK LIMITED
to which all correspondence should be sent (including the postcode) European IPLD
Faraday Road, Dorcan, Swindon
Wiltshire, SN3 5HH,
United Kingdom.

Patents ADP number (if you know it) ~~23655002~~ 07993520002

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number	Country	Priority application number (if you know it)	Date of filing (day / month / year)

7.. If this application is divided or otherwise derived from an earlier UK application give the number and the filing date of the earlier application	Priority application number (if you know it)	Date of filing (day / month / year)

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? YES

(Answer 'Yes' if:

- a) any applicant named in part 3 is not an inventor, or
- b) there is an inventor who is not named as an applicant, or
- c) any named applicant is a corporate body.



9. Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document

Continuation sheets of this form

Description 3

Claims(s) 1

Abstract -

Drawing(s) 2 

10. If you are also filing any of the following, state how many against each item.

Priority documents

Translations of priority documents

Statement of inventorship and right to grant of a patent (*Patents Form 7/77*)

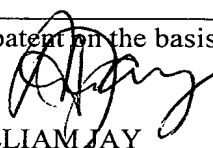
Request for preliminary examination and search (*Patents Form 9/77*) 1

Request for substantive examination (*Patents Form 10/77*)

Any other documents FEE SHEET
(please specify)

11. I/We request the grant of a patent on the basis of this application.

Signature



Date 2 October 2003

ANTHONY WILLIAM JAY

12. Name and daytime telephone number of person to contact in the United Kingdom SHIRLEY NOTT 01793 572120

Warning

After an application for a patent has been filed, the Comptroller of the Patent Office will consider whether publication or communication of the invention should be prohibited or restricted under Section 22 of the Patents Act 1977. You will be informed if it is necessary to prohibit or restrict your invention in this way. Furthermore, if you live in the United Kingdom, Section 23 of the Patents Act 1977 stops you from applying for a patent abroad without first getting written permission from the Patent Office unless an application has been filed at least 6 weeks beforehand in the United Kingdom for a patent for the same invention and either no direction prohibiting publication or communication has been given, or any such direction has been revoked.

Notes

- If you need help to fill in this form or you have any questions, please contact the Patent Office on 0645 500505.
- Write your answers in capital letters using black ink or you may type them.
- If there is not enough space for all the relevant details on any part of this form, please continue on a separate sheet of paper and write "see continuation sheet" in the relevant part(s). Any continuation sheet should be attached to this form.
- If you have answered 'Yes' Patents Form 7/77 will need to be filed.
- Once you have filled in the form you must remember to sign and date it.
- For details of the fee and ways to pay please contact the Patent Office.

SEALING DEVICE

This invention is an additional and/or complementary aspect of the compression-expandable plugs described in UK Patent Application 0227985.9.

The present aspect relates to the ingenious use of compression-expandable plugs to seal around and secure mini-tubes in optical fibre cable ducts, thus resisting (a) movement of the mini-tubes within the ducts, which might damage the fragile optical fibres contained inside the mini-tubes, and (b) passage of fluids along the ducts, which fluids might enter and contaminate working areas such as manholes, or equipment rooms or enclosures. This use of such plugs runs contrary to the expectation that the plug sealing pressure would risk damaging the optical fibres, such damage not being an issue with electrical cables. It is therefore preferred, according to this aspect of the invention, to provide means for limiting the applied plug pressure to levels below those at which damage to the optical cable components becomes a significant risk.

Embodiments of this aspect of the invention will now be described in more detail by way of example with reference to the accompanying perspective drawings, in which corresponding parts are correspondingly numbered and wherein:-

Figure 1 shows a plug designed to seal up to five mini-tubes of 10mm diameter in an optical fibre duct, and

Figure 2 shows a plug designed to seal up to ten mini-tubes of 7mm diameter in an optical fibre duct, the ducts being omitted in both figures for clarity. The size of the mini-tubes is not critical, and the number may be as high as 24 in some sizes.

Referring to both drawings, a central tubular gasket 3 of flexible elastomer or other suitable material, preferably chloroprene rubber, has the desired number of axial passages 31 for receiving the mini-tubes to be sealed and a central axial bore 32 for receiving a compression bolt 1. Blank filler rods may be inserted to close any of the gasket passages which are not occupied by one of the mini-tubes of the optical fibre cable. The gasket passages 31 preferably each have an axially- or lengthwise-extending slit 33 communicating laterally with the exterior of the gasket to allow lateral insertion of a mini-tube (omitted for clarity) into each passage.

The axial length of the gasket is not critical, but should be selected by simple trial and error to seal effectively in the conditions encountered in practice. Gasket lengths within the range 50 to 80 mm, preferably 60 to 70 mm, have been found advantageous in practice. The laterally-extending slits 33 are preferably sloped or curved to enable them to be positioned

extending in an anti-clockwise sense as viewed looking toward the open end of the duct into which the plug is inserted. This anti-clockwise orientation resists undesirable opening of the slits by clockwise turning forces which may be transmitted to the gasket during clockwise tightening of the gasket compression means, for example as hereinafter described.

A compression member 2 of relatively rigid moulded plastics or other material, preferably polyoxymethylene, is provided at each end of the gasket 3, each compression member having recesses 21 corresponding with the passages 31 of the gasket and projections 25 extending between the recesses 21 to an extent approaching the outer circumference of the gasket 3. The compression members also have a central aperture 22, whereby the plug can be assembled with a compression bolt 1 of metal or engineering plastics passing through the central bore 32 of the gasket and the central apertures 22 of the compression members positioned at each end of the gasket. The mini-tubes (not shown) extend through the respective passages 31 and recesses 21 of the gasket and compression members in use.

The plug assembly may then be completed by screwing the long nut 4 onto the thread 11 of the compression bolt 1. The nut 4 may be constructed with a blind threaded bore 31 of limited depth in order to limit the applied compression and resulting radial expansion of the gasket as the nut and bolt draw the two compression members 2 towards each other. In this way, the compression applied to the mini-tubes by the radially expanding gasket may be limited to safe levels.

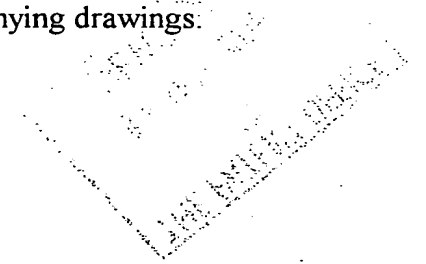
The plug is preferably inserted into the optical fibre duct, from the open end of which the mini-tubes project, by sliding along the mini-tubes after they have been positioned in the passages 31 and recesses 21 of the assembled plug. Liquid soap solution, or other suitable lubricant, is recommended to assist this operation. An end of the gasket may be marked (B) to ensure that it is positioned toward the head of the bolt 1 which is inserted first into the duct, thus aligning the preferred sloping or curved slits 33 in the anti-clockwise sense for the aforementioned reasons. The bolt head and the bolt-receiving apertures 22 in the compression members are preferably formed to prevent rotation of the bolt relative to the compression members during tightening of the nut 4.

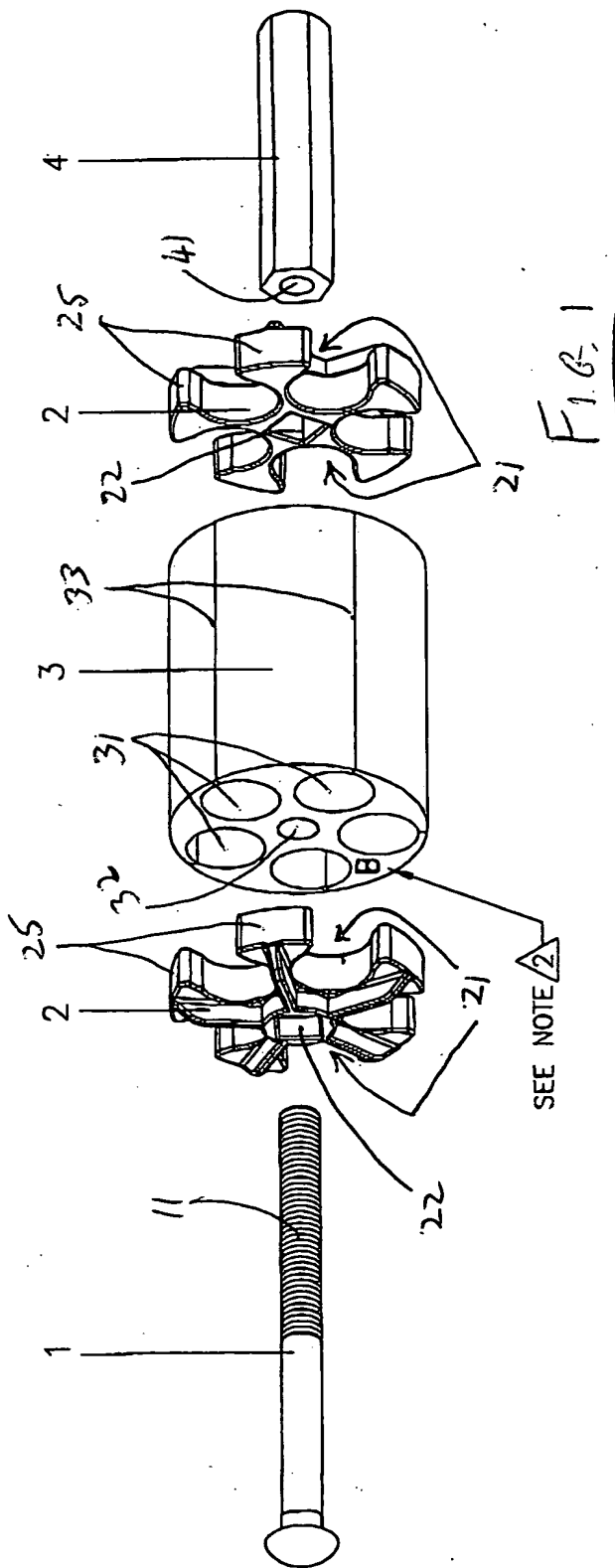
The nut 4 is preferably of an external length sufficient to facilitate engaging it by hand (initially), or with a suitable spanner or other tool inserted between the mini-tubes extending from the plug. The nut can thereby be tightened to compress and seal the gasket inside the cable duct, and can subsequently be unscrewed and pulled to loosen and withdraw the plug from the duct. The mini-tubes tend to be fairly stiff and could hinder access to shorter nuts or necessitate special tools for these purposes.

For this additional aspect of the invention, the gasket, and the plug as a whole, may incorporate some or all of the features described in the aforementioned UK Patent Application 0227985.9; or the arrangements shown in the present illustrative drawings may be used; or other forms of compression plug may be devised for this inventive use in optical fibre ducts.

CLAIMS

1. Use of a compression-expandable plug providing lateral expansion of an elastomeric gasket to seal around mini-tubes within an optical fibre duct, the mini-tubes containing optical fibres.
2. A compression-expandable plug for use according to claim 1, comprising an elastomeric gasket having longitudinal passages positionable in use around optical-fibre-containing mini-tubes in an optical fibre duct, and means for longitudinally compressing the gasket thereby laterally expanding it to exert sealing pressure around the mini-tubes and between the mini-tubes and the duct.
3. Use or plug according to claim 1 or 2, wherein means are provided for limiting the longitudinal compression which can be applied to the gasket so as to limit the sealing pressure to levels below those likely to damage the optical fibres.
4. Use or plug according to claim 3, wherein the means for compressing is a nut and bolt and the means for limiting the compression is a blind-ended thread in the nut.
5. Use or plug according to claim 2, 3, or 4, wherein the said passages of the gasket have longitudinal slits extending laterally to the exterior of the gasket to allow lateral insertion of the said mini-tubes into the passages.
6. Use or plug according to claim 5, wherein the said slits are sloped or curved in anti-clockwise sense as viewed from a first end of the gasket.
7. Use or plug according to claim 6, wherein the gasket is marked to show an installer which end of the gasket to insert first into the duct in order to orient the slits in the said anti-clockwise sense as viewed from outside the end of the duct into which the gasket is inserted.
8. Use or plug according to any preceding claim, wherein the plug incorporates features described in UK Patent Application 0227985.9.
9. Use or plug according to any of claims 1 to 7, wherein the plug incorporates features substantially as hereinbefore described with reference to the accompanying drawings.



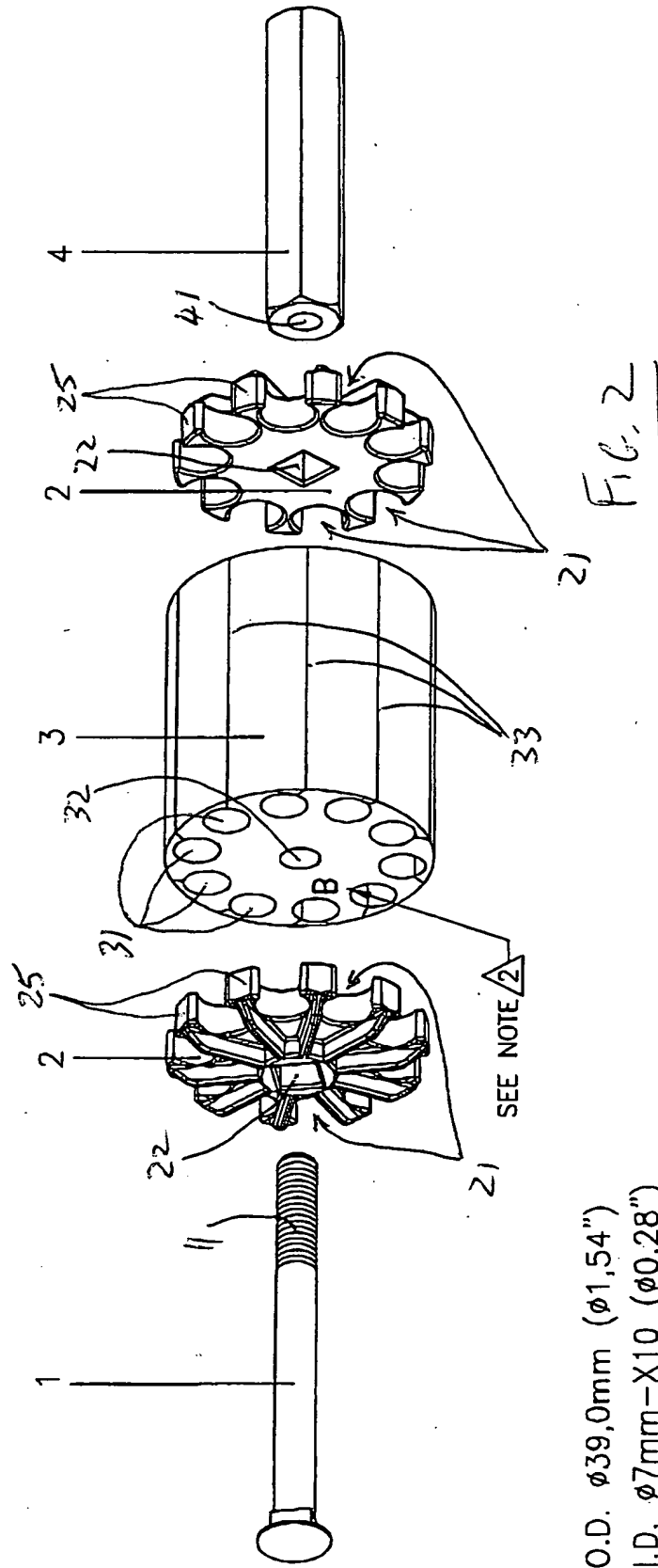


O.D. $\phi 32,0\text{mm}$ ($\phi 1,26''$)
 I.D. $\phi 10\text{mm-X5}$ ($\phi 0,39''$)

NOTES:

1. ASSEMBLY TO BE PRINTED WITH PRODUCT ID AND COUNTRY OF ORIGIN.
2. GASKET TO BE INSTALLED WITH THE LETTER "B" ON THE BOTTOM (BOLT END) OF THE ASSEMBLY.





O.D. $\phi 39,0\text{mm}$ ($\phi 1,54''$)
 I.D. $\phi 7\text{mm}$ -X10 ($\phi 0,28''$)

NOTES:

1. ASSEMBLY TO BE PRINTED WITH PRODUCT ID AND COUNTRY OF ORIGIN.
2. GASKET TO BE INSTALLED WITH THE LETTER "B" ON THE BOTTOM (BOLT END) OF THE ASSEMBLY.

THIS PAGE BLANK (USPTO)